

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-287575

(43)Date of publication of application : 11.10.1994

(51)Int.Cl.

C10K 1/32  
B01D 53/34  
H01M 8/04  
H01M 8/06

(21)Application number : 05-100106

(71)Applicant : ISHIKAWAJIMA HARIMA HEAVY IND  
CO LTD

(22)Date of filing : 05.04.1993

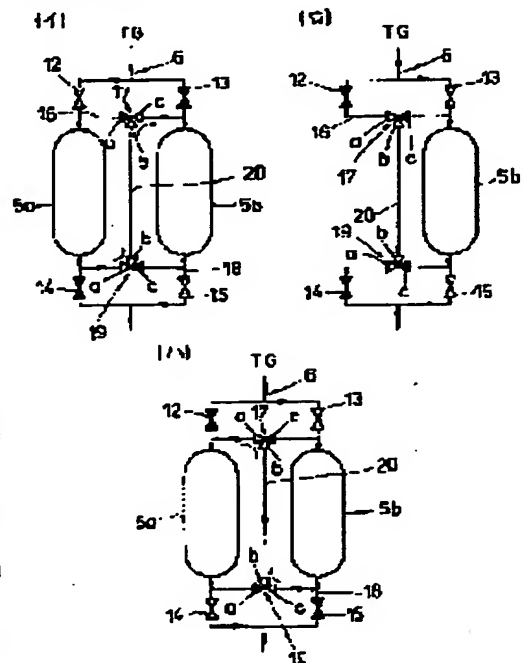
(72)Inventor : HIRATA TETSUYA  
MIZUSAWA MINORU

## (54) DESULFURIZATION PROCESS AND APPARATUS THEREFOR

### (57)Abstract:

**PURPOSE:** To utilize the desulfurization catalyst to its full capacity in a desulfurizer.

**CONSTITUTION:** Two desulfurizers 5a and 5b are connected in parallel. On-off valves 12, 13, 14 and 15 are provided at the respective inlets and exits of the two desulfurizers 5a and 5b. The line between the desulfurizer 5a and the on-off valve 12 and the line between the desulfurizer 5b and the on-off valve 13 are connected with each other through a by-pass pipe 15 interrupted by a three-way valve 17. Similarly, the line between the desulfurizer 5a and the on-off valve 14 and the line between the desulfurizer 5b and the on-off valve 15 are connected with each other through a by-pass pipe 18 interrupted by a three-way valve 19. The three-way valves 17 and 19 are connected with each other through a connection pipe 20. Thus, either of the desulfurizers 5a and 5b can be selected as upstream one by connecting them in series by changing over the on-off valves 12, 13, 14 and 15 and the three-way valve 19.



## LEGAL STATUS

[Date of request for examination] 19.08.1999

[Date of sending the examiner's decision of rejection] 17.12.2002

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision]

of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**CLAIMS**

---

[Claim(s)]

[Claim 1] Either connects two desulfurizers to a serial so that another side may become the upstream with the downstream, and it is made to pass the desulfurizer of the downstream for the gas by which desulfurization processing was carried out with the desulfurizer of the upstream. Subsequently The desulfurizer which it is made to make desulfurize with the desulfurizer of the downstream, next finished exchange of the above-mentioned desulfurization catalyst is the desulfurization approach characterized by making it switch and desulfurize so that the desulfurizer which was the above-mentioned downstream may serve as the upstream at the downstream during desulfurization catalyst exchange of the desulfurizer of the above-mentioned upstream.

[Claim 2] The desulfurizing plant characterized by connecting between the closing motion valve downstream locations of each entrance side of both the above-mentioned desulfurizers, and between the closing motion valve upstream locations of each outlet side of both desulfurizers for bypass piping, respectively, preparing a cross valve all over each way of both bypass piping, and coming to connect these cross valves by interunit piping while connecting two desulfurizers to juxtaposition and preparing a closing motion valve in the entrance side and outlet side of each desulfurizer, respectively.

---

[Translation done.]

\* NOTICES \*

- JPO and NCIP are not responsible for any damages caused by the use of this translation.
- 1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2. \*\*\*\* shows the word which can not be translated.
- 3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the desulfurization approach and equipment which are used in order to make it desulfurize before reforming material gas with a refining vessel mainly by the fuel cell generation-of-electrical-energy system.

[0002]

[Description of the Prior Art] the electrolyte plate (tile) with which a fused carbonate fuel cell makes a melting carbonate come to sink into the porosity matter as an electrolyte among fuel cells -- the two electrodes of a cathode (air pole) and an anode (fuel electrode) -- from both sides -- inserting -- a cathode side -- oxidation gas -- moreover, what supplied fuel gas to the anode side, respectively is used as one cel, the laminating of each cel is carried out to a multilayer, and it has been made to consider as a stack.

[0003] What used town gas as material gas by the generation-of-electrical-energy system using this fused carbonate fuel cell As the outline of an example of a system system configuration is shown in drawing 2 , the refining machine 4 is installed in the entrance side of the anode 3 of the fuel cell I which carried out the laminating of the cel which makes it come from both sides to pinch an electrolyte plate 1 with a cathode 2 and an anode 3, and was made into the stack. Before reforming town gas TG as material gas with the refining vessel 4 and considering as the fuel gas to an anode 3, in order to dislike the sulfur content by which the catalyst for refining in the refining machine 4 is included in town gas TG, It has prepared into the material gas supply line 6, and the desulfurizer 5 for removing the sulfur in town gas TG desulfurizes town gas TG which carried out pressure up by the blower 7 with a desulfurizer 5, preheats desulfurized town gas TG with the natural gas preheater 8, and is supplied to the refining room of the refining machine 4.

[0004] In addition, the fuel gas by which refining was carried out with the refining vessel 4 is supplied to an anode 3, and the anode outlet gas discharged from the anode 3 is supplied to the combustion chamber of the refining machine 4 through the natural gas preheater 8 from the anode outlet gas line 9. The combustion gas discharged from this combustion chamber is supplied to a cathode 2 with the air A supplied from the air supply line 10. It is made to be supplied in a part of air in the combustion chamber of the refining machine 4 through the branching line 11 which it is made to be emitted [ line ] to atmospheric air, and branched the cathode outlet gas discharged from the cathode 2 from the air supply line 10.

[0005] In the fuel cell generation-of-electrical-energy system, in order to make continuous running of a plant possible, a desulfurizer usually connects two sets to juxtaposition, and using only either is performed.

[0006] As a conventional desulfurizing plant, as shown in drawing 3 , in the middle of the material gas supply line 6, juxtaposition is connected and equipped with two desulfurizers 5a and 5b, the closing motion valves 12, 13, 14, and 15 are formed in the entrance side and outlet side of each desulfurizers 5a and 5b, respectively, and what used only either by the closing motion valve 12 and the change of 13, 14, and 15 is used.

[0007] Namely, while carrying out desulfurization processing of town gas TG using one

desulfurizer 5a, [ for example, ] If the closing motion valves 13 and 15 of the entrance side of desulfurizer 5b of another side and an outlet side are made close, the sulfur content in town gas TG is made to stick to the desulfurization catalyst in one desulfurizer 5a, desulfurization reaction is carried out to it and desulfurization by this desulfurizer 5a comes to a capacity limitation. Make switches 13 and 15 open and it is made to switch to the activity of desulfurizer 5b of another side at the same time it closes switches 12 and 14, and he supplies desulfurized town gas TG to the refining machine 4, and is trying to reform to fuel gas.

[0008]

[Problem(s) to be Solved by the Invention] However, when using either desulfurizer 5a or 5b, Since it cannot predict when the desulfurization catalyst in each desulfurizer 5a and 5b will be in the condition (the so-called breakthrough) that sulfur content comes out of the outlet side of desulfurizer 5a or 5b across an adsorption capacity force limitation, While having to extract and carry out gas analysis of the gas from Desulfurizers 5a and 5b In order to prevent beforehand, that the above-mentioned sulfur content comes out of desulfurizer 5a or 5b Since he is trying to switch to another desulfurizer a little early, without using desulfurizer 5a in use or 5b to the capacity limitation of an adsorption catalyst, Desulfurizers 5a and 5b cannot be used to a capacity limitation, but there is a problem of making the high desulfurization catalyst of cost useless.

[0009] then, in the configuration which arranges two desulfurizers to juxtaposition and has been used by turns, this invention can be made to carry out the until [ capacity full ] activity of each desulfurizer, and needs to be made not to carry out gas analysis.

[0010]

[Means for Solving the Problem] Two desulfurizers are connected to a serial in order that this invention may solve the above-mentioned technical problem. It is made to pass the desulfurizer of the downstream for the gas by which desulfurization processing was carried out with the desulfurizer of the upstream. The desulfurizer of the above-mentioned upstream considers as the approach of making the upstream switching and desulfurizing the desulfurizer which was the above-mentioned downstream again at the downstream about the desulfurizer which was made used and desulfurizing only the desulfurizer of the downstream, next finished exchange of a desulfurization catalyst, during desulfurization catalyst exchange exceeding desulfurization capacity.

[0011] Moreover, in the configuration which carried out parallel connection of the closing motion valve in preparation for each entrance side and the outlet side of two desulfurizers, between the closing motion valve downstream locations of each entrance side of the two above-mentioned desulfurizers and between the two above-mentioned closing-motion valve upstream locations of each outlet side of a desulfurizer are connected for bypass piping, respectively, a cross valve is prepared all over each way of both bypass piping, and it considers as the configuration which prepared the interunit piping which connects these cross valves.

[0012]

[Function] since it is made to stick to the desulfurizer located in the upstream with another desulfurizer located in the downstream if two desulfurizers are used in the state of a serial even if an internal desulfurization catalyst is used to an adsorption-capacity force limitation and sulfur content should come out, even if the desulfurizer located in the upstream extracts gas from the desulfurizer which can carry out a until [ capacity full ] activity, and is located in the upstream and does not analyze gas one by one, it ends.

[0013] when exchanging the desulfurizer located in the upstream, it is made to desulfurize only with the desulfurizer of the downstream and the desulfurizer used as the upstream is exhausted until capacity full by making into the downstream the desulfurizer which finished exchange to a new desulfurization catalyst.

[0014]

[Example] Hereafter, the example of this invention is explained with reference to a drawing.

[0015] (\*\*) (Ha) is what shows the example of this invention to which the change of two desulfurizers, exchange, and a change are made to perform. the drawing 1 (\*\*) -- In the configuration with which two desulfurizers 5a and 5b are connected to juxtaposition, and the

closing motion valves 12 and 14 and 15 are prepared in each entrance side and an outlet side in the middle of the feeding line 6 like the conventional method shown in drawing 3 While connecting the downstream location of the closing motion valves 12 and 13 in each entrance side of the two above-mentioned desulfurizers 5a and 5b for the bypass piping 16 which has a cross valve 17 on the way The upstream location of the closing motion valves 14 and 15 in each outlet side of both the above-mentioned desulfurizers 5a and 5b It connects for the bypass piping 18 which has a cross valve 19 on the way, and the above-mentioned cross valves 17 and 19 are connected by interunit piping 20. The closing motion valves 12, 13, 14, and 15 suitably Closing motion, It can be made to perform the serial activity which makes the upstream either of the desulfurizers 5a and 5b with close [ of the gate of the arbitration of cross valves 17 and 19 ], and one of independent activities.

[0016] While making the closing motion valves 12 and 15 open, and making 13 and 14 close and making Gate a close among three gates a, b, and c of a cross valve 17 like drawing 1 (b) now If Gate c is made close among three gates a, b, and c of a cross valve 19, the feeding line 6 will be supplied and town gas TG will enter in one desulfurizer 5a through the closing motion valve 12. Town gas TG by which sulfur content was made to adsorb according to an internal desulfurization catalyst here, and desulfurization processing was carried out is introduced in desulfurizer 5b of another side through the gates a and b where the bypass piping 18 and a cross valve 19 were opened, interunit piping 20, the gates b and c where the cross valve 17 was opened, and the bypass piping 16, is taken out from the outlet side of this desulfurizer 5b through the closing motion valve 15, and is led to the refining machine 4 (refer to drawing 2 ).

[0017] Desulfurizer 5a as mentioned above in the condition of having made it connecting with the upstream at a serial so that desulfurizer 5b may become the downstream By carrying out desulphurization reaction of town gas TG by desulfurizer 5a of the upstream Even if the situation of the so-called breakthrough where the desulfurization catalyst of desulfurizer 5a in this upstream will be in the condition that an adsorption capacity force limitation should be arrived at and desulfurization catalysts must be exchanged, and sulfur content comes out from this desulfurizer 5a arises, it can be made to be able to adsorb by desulfurizer 5b of the downstream, and runoff can be prevented. while not taking out gas from desulfurizer 5a by this and not analyzing one by one, desulfurizer 5a can be used up until capacity full.

[0018] When exchanging the desulfurization catalyst of desulfurizer 5a located in the upstream by the above-mentioned operation, as are shown in drawing 1 (b), and the closing motion valve 13 is changed into the condition of having switched open and the closing motion valve 12 to close, and having switched the gate c of a change and a cross valve 17 to close and town gas TG is directly introduced into desulfurizer 5b, since, desulfurizer 5a is removed.

[0019] While switching the closing motion valve 14 to open and switching the closing motion valve 15 to close as shown in drawing 1 (Ha) if desulfurizer 5a which finished exchange is again included in a new desulfurization catalyst during operation of only desulfurizer 5b shown in the drawing 1 (\*\*) desulfurizer 5b which switched the gate a of a cross valve 19 to close, and it is made for desulfurizer 5a to which desulfurizer 5b under operation exchanged the desulfurization catalyst for the upstream to become the downstream, and became the upstream is used up until capacity full.

[0020] In drawing 1 (Ha), when exchanging desulfurizer 5b of the upstream, while the closing motion valve 12 is switched to open and it switches the closing motion valve 13 to close, switch the gate a of a cross valve 17 to close, it is made to become the individual operation of desulfurizer 5a of the downstream, and desulfurizer 5b is exchanged. If desulfurizer 5b which finished exchange of a desulfurization catalyst is incorporated, while switching the closing motion valve 15 to open and switching the closing motion valve 14 to close, it changes into the condition of drawing 1 (b), and the same change is repeated and it is made to make it desulfurize henceforth by switching the gate c of a cross valve 19 to close.

[0021] In addition, although it was the fuel cell generation-of-electrical-energy system which makes town gas material gas, and it followed in the above-mentioned explanation when making it desulfurize by the upstream in order that the refining machine of material gas might dislike sulfur content, of course, modification can be variously added to what has some which dislike sulfur

content in the downstream except a fuel cell power plant within line which do not deviate from the summary of that it is a thing applicable to all, and other this inventions.

[0022]

[Effect of the Invention] As stated above, when according to the desulfurization approach of this invention, and equipment connecting two desulfurizers to a serial, carrying out desulfurization processing with the desulfurizer of the upstream and exchanging the desulfurization catalyst of the desulfurizer of this upstream, it considers as the individual operation of the desulfurizer of the downstream. Subsequently Since it is made for the desulfurizer which finished exchange of a desulfurization catalyst to serve as the downstream, and it is made to make them desulfurize them by turns as two desulfurizers can be chosen as the upstream and the downstream, the desulfurizer used as the upstream Even if it will be discharged without using up a desulfurization catalyst to an adsorption capacity force limitation and desulfurizing sulfur content since it can be made to adsorb with the desulfurizer of the downstream, the desulfurizer used as the upstream can carry out a until [ capacity full ] activity, and it can do so the effectiveness which can exchange desulfurization catalysts and which was easily excellent in \*\* also in operation while it can aim at a deployment of an expensive desulfurization catalyst and can aim at reduction of desulfurization cost.

---

[Translation done.]

\* NOTICES \*

-JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

TECHNICAL FIELD

[Industrial Application] This invention relates to the desulfurization approach and equipment which are used in order to make it desulfurize before reforming material gas with a refining vessel mainly by the fuel cell generation-of-electrical-energy system.

---

[Translation done.]

\* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

PRIOR ART

[Description of the Prior Art] the electrolyte plate (tile) with which a fused carbonate fuel cell makes a melting carbonate come to sink into the porosity matter as an electrolyte among fuel cells -- the two electrodes of a cathode (air pole) and an anode (fuel electrode) -- from both sides -- inserting -- a cathode side -- oxidation gas -- moreover, what supplied fuel gas to the anode side, respectively is used as one cel, the laminating of each cel is carried out to a multilayer, and it has been made to consider as a stack.

[0003] What used town gas as material gas by the generation-of-electrical-energy system using this fused carbonate fuel cell As the outline of an example of a system system configuration is shown in drawing 2 , the refining machine 4 is installed in the entrance side of the anode 3 of the fuel cell I which carried out the laminating of the cel which makes it come from both sides to pinch an electrolyte plate 1 with a cathode 2 and an anode 3, and was made into the stack. Before reforming town gas TG as material gas with the refining vessel 4 and considering as the fuel gas to an anode 3, in order to dislike the sulfur content by which the catalyst for refining in the refining machine 4 is included in town gas TG, It has prepared into the material gas supply line 6, and the desulfurizer 5 for removing the sulfur in town gas TG desulfurizes town gas TG which carried out pressure up by the blower 7 with a desulfurizer 5, preheats desulfurized town gas TG with the natural gas preheater 8, and is supplied to the refining room of the refining machine 4.

[0004] In addition, the fuel gas by which refining was carried out with the refining vessel 4 is supplied to an anode 3, and the anode outlet gas discharged from the anode 3 is supplied to the combustion chamber of the refining machine 4 through the natural gas preheater 8 from the anode outlet gas line 9. The combustion gas discharged from this combustion chamber is supplied to a cathode 2 with the air A supplied from the air supply line 10. It is made to be supplied in a part of air in the combustion chamber of the refining machine 4 through the branching line 11 which it is made to be emitted [ line ] to atmospheric air, and branched the cathode outlet gas discharged from the cathode 2 from the air supply line 10.

[0005] In the fuel cell generation-of-electrical-energy system, in order to make continuous running of a plant possible, a desulfurizer usually connects two sets to juxtaposition, and using only either is performed.

[0006] As a conventional desulfurizing plant, as shown in drawing 3 , in the middle of the material gas supply line 6, juxtaposition is connected and equipped with two desulfurizers 5a and 5b, the closing motion valves 12, 13, 14, and 15 are formed in the entrance side and outlet side of each desulfurizers 5a and 5b, respectively, and what used only either by the closing motion valve 12 and the change of 13, 14, and 15 is used.

[0007] Namely, while carrying out desulfurization processing of town gas TG using one desulfurizer 5a, [ for example, ] If the closing motion valves 13 and 15 of the entrance side of desulfurizer 5b of another side and an outlet side are made close, the sulfur content in town gas TG is made to stick to the desulfurization catalyst in one desulfurizer 5a, desulphurization reaction is carried out to it and desulfurization by this desulfurizer 5a comes to a capacity limitation Make switches 13 and 15 open and it is made to switch to the activity of desulfurizer 5b of another side at the same time it closes switches 12 and 14, and he supplies desulfurized

town gas TG to the refinery machine 4, and is trying to reform to fuel gas.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

EFFECT OF THE INVENTION

---

[Effect of the Invention] As stated above, when according to the desulfurization approach of this invention, and equipment connecting two desulfurizers to a serial, carrying out desulfurization processing with the desulfurizer of the upstream and exchanging the desulfurization catalyst of the desulfurizer of this upstream, it considers as the individual operation of the desulfurizer of the downstream. Subsequently Since it is made for the desulfurizer which finished exchange of a desulfurization catalyst to serve as the downstream, and it is made to make them desulfurize them by turns as two desulfurizers can be chosen as the upstream and the downstream, the desulfurizer used as the upstream Even if it will be discharged without using up a desulfurization catalyst to an adsorption capacity force limitation and desulfurizing sulfur content since it can be made to adsorb with the desulfurizer of the downstream, the desulfurizer used as the upstream can carry out a until [ capacity full ] activity, and it can do so the effectiveness which can exchange desulfurization catalysts and which was easily excellent in \*\* also in operation while it can aim at a deployment of an expensive desulfurization catalyst and can aim at reduction of desulfurization cost.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**TECHNICAL PROBLEM**

---

[Problem(s) to be Solved by the Invention] However, when using either desulfurizer 5a or 5b, Since it cannot predict when the desulfurization catalyst in each desulfurizer 5a and 5b will be in the condition (the so-called breakthrough) that sulfur content comes out of the outlet side of desulfurizer 5a or 5b across an adsorption capacity force limitation, While having to extract and carry out gas analysis of the gas from Desulfurizers 5a and 5b In order to prevent beforehand, that the above-mentioned sulfur content comes out of desulfurizer 5a or 5b Since he is trying to switch to another desulfurizer a little early, without using desulfurizer 5a in use or 5b to the capacity limitation of an adsorption catalyst, Desulfurizers 5a and 5b cannot be used to a capacity limitation, but there is a problem of making the high desulfurization catalyst of cost useless.

[0009] then, in the configuration which arranges two desulfurizers to juxtaposition and has been used by turns, this invention can be made to carry out the until [ capacity full ] activity of each desulfurizer, and needs to be made not to carry out gas analysis.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**MEANS**

---

[Means for Solving the Problem] Two desulfurizers are connected to a serial in order that this invention may solve the above-mentioned technical problem. It is made to pass the desulfurizer of the downstream for the gas by which desulfurization processing was carried out with the desulfurizer of the upstream. The desulfurizer of the above-mentioned upstream considers as the approach of making the upstream switching and desulfurizing the desulfurizer which was the above-mentioned downstream again at the downstream about the desulfurizer which was made used and desulfurizing only the desulfurizer of the downstream, next finished exchange of a desulfurization catalyst, during desulfurization catalyst exchange exceeding desulfurization capacity.

[0011] Moreover, in the configuration which carried out parallel connection of the closing motion valve in preparation for each entrance side and the outlet side of two desulfurizers, between the closing motion valve downstream locations of each entrance side of the two above-mentioned desulfurizers and between the two above-mentioned closing-motion valve upstream locations of each outlet side of a desulfurizer are connected for bypass piping, respectively, a cross valve is prepared all over each way of both bypass piping, and it considers as the configuration which prepared the interunit piping which connects these cross valves.

---

[Translation done.]

**\* NOTICES \***

- -JPO and NCIPi are not responsible for any damages caused by the use of this translation.
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**OPERATION**

---

[Function] since it is made to stick to the desulfurizer located in the upstream with another desulfurizer located in the downstream if two desulfurizers are used in the state of a serial even if an internal desulfurization catalyst is used to an adsorption-capacity force limitation and sulfur content should come out, even if the desulfurizer located in the upstream extracts gas from the desulfurizer which can carry out a until [ capacity full ] activity, and is located in the upstream and does not analyze gas one by one, it ends.

[0013] when exchanging the desulfurizer located in the upstream, it is made to desulfurize only with the desulfurizer of the downstream and the desulfurizer used as the upstream is exhausted until capacity full by making into the downstream the desulfurizer which finished exchange to a new desulfurization catalyst.

---

[Translation done.]

\* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

EXAMPLE

[Example] Hereafter, the example of this invention is explained with reference to a drawing.

[0015] (\*\*) (Ha) is what shows the example of this invention to which the change of two desulfurizers, exchange, and a change are made to perform. the drawing 1 (\*\*) -- In the configuration with which two desulfurizers 5a and 5b are connected to juxtaposition, and the closing motion valves 12, 13, and 14 and 15 are prepared in each entrance side and an outlet side in the middle of the feeding line 6 like the conventional method shown in drawing 3 While connecting the downstream location of the closing motion valves 12 and 13 in each entrance side of the two above-mentioned desulfurizers 5a and 5b for the bypass piping 16 which has a cross valve 17 on the way The upstream location of the closing motion valves 14 and 15 in each outlet side of both the above-mentioned desulfurizers 5a and 5b It connects for the bypass piping 18 which has a cross valve 19 on the way, and the above-mentioned cross valves 17 and 19 are connected by interunit piping 20. The closing motion valves 12, 13, 14, and 15 suitably Closing motion, It can be made to perform the serial activity which makes the upstream either of the desulfurizers 5a and 5b with close [ of the gate of the arbitration of cross valves 17 and 19 ], and one of independent activities.

[0016] While making the closing motion valves 12 and 15 open, and making 13 and 14 close and making Gate a close among three gates a, b, and c of a cross valve 17 like drawing 1 (b) now If Gate c is made close among three gates a, b, and c of a cross valve 19, the feeding line 6 will be supplied and town gas TG will enter in one desulfurizer 5a through the closing motion valve 12. Town gas TG by which sulfur content was made to adsorb according to an internal desulfurization catalyst here, and desulfurization processing was carried out is introduced in desulfurizer 5b of another side through the gates a and b where the bypass piping 18 and a cross valve 19 were opened, interunit piping 20, the gates b and c where the cross valve 17 was opened, and the bypass piping 16, is taken out from the outlet side of this desulfurizer 5b through the closing motion valve 15, and is led to the refining machine 4 (refer to drawing 2).

[0017] Desulfurizer 5a as mentioned above in the condition of having made it connecting with the upstream at a serial so that desulfurizer 5b may become the downstream By carrying out desulphurization reaction of town gas TG by desulfurizer 5a of the upstream Even if the situation of the so-called breakthrough where the desulfurization catalyst of desulfurizer 5a in this upstream will be in the condition that an adsorption capacity force limitation should be arrived at and desulfurization catalysts must be exchanged, and sulfur content comes out from this desulfurizer 5a arises, it can be made to be able to adsorb by desulfurizer 5b of the downstream, and runoff can be prevented. while not taking out gas from desulfurizer 5a by this and not analyzing one by one, desulfurizer 5a can be used up until capacity full.

[0018] When exchanging the desulfurization catalyst of desulfurizer 5a located in the upstream by the above-mentioned operation, as are shown in drawing 1 (b), and the closing motion valve 13 is changed into the condition of having switched open and the closing motion valve 12 to close, and having switched the gate c of a change and a cross valve 17 to close and town gas TG is directly introduced into desulfurizer 5b, since, desulfurizer 5a is removed.

[0019] While switching the closing motion valve 14 to open and switching the closing motion valve 15 to close as shown in drawing 1 (Ha) if desulfurizer 5a which finished exchange is again

included in a new desulfurization catalyst during operation of only desulfurizer 5b shown in the drawing 1 (\*\*) desulfurizer 5b which switched the gate a of a cross valve 19 to close, and it is made for desulfurizer 5a to which desulfurizer 5b under operation exchanged the desulfurization catalyst for the upstream to become the downstream, and became the upstream is used up until capacity full.

[0020] In drawing 1 (Ha), when exchanging desulfurizer 5b of the upstream, while the closing motion valve 12 is switched to open and it switches the closing motion valve 13 to close, switch the gate a of a cross valve 17 to close, it is made to become the individual operation of desulfurizer 5a of the downstream, and desulfurizer 5b is exchanged. If desulfurizer 5b which finished exchange of a desulfurization catalyst is incorporated, while switching the closing motion valve 15 to open and switching the closing motion valve 14 to close, it changes into the condition of drawing 1 (b), and the same change is repeated and it is made to make it desulfurize henceforth by switching the gate c of a cross valve 19 to close.

[0021] In addition, although it was the fuel cell generation-of-electrical-energy system which makes town gas material gas, and it followed in the above-mentioned explanation when making it desulfurize by the upstream in order that the refining machine of material gas might dislike sulfur content, of course, modification can be variously added to what has some which dislike sulfur content in the downstream except a fuel cell power plant within limits which do not deviate from the summary of that it is a thing applicable to all, and other this inventions.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. \*\*\*\* shows the word which can not be translated.

3. In the drawings, any words are not translated.

---

**DESCRIPTION OF DRAWINGS**

---

[Brief Description of the Drawings]

[Drawing 1] A state diagram when a desulfurizer is removed and while the state diagram and (\*\*) which carried out the series connection so that the desulfurization approach of this invention and the example of equipment may be shown and (\*\*) might become the upstream about one desulfurizer are the upstream is exchanging desulfurization catalysts, and (Ha) are the state diagrams which switched the desulfurizer which finished exchange of a desulfurization catalyst to the downstream.

[Drawing 2] It is the schematic diagram of a system system configuration showing an example of a town gas refining mold fuel cell generation-of-electrical-energy system.

[Drawing 3] It is the schematic diagram of the conventional desulfurizing plant.

[Description of Notations]

5, 5a, 5b Desulfurizer

12, 13, 14, 15 Closing motion valve

16 Bypass Piping

17 Cross Valve

18 Bypass Piping

19 Cross Valve

20 Interunit Piping

---

[Translation done.]

\* NOTICES \*

JPO and NCIPJ are not responsible for any damages caused by the use of this translation.

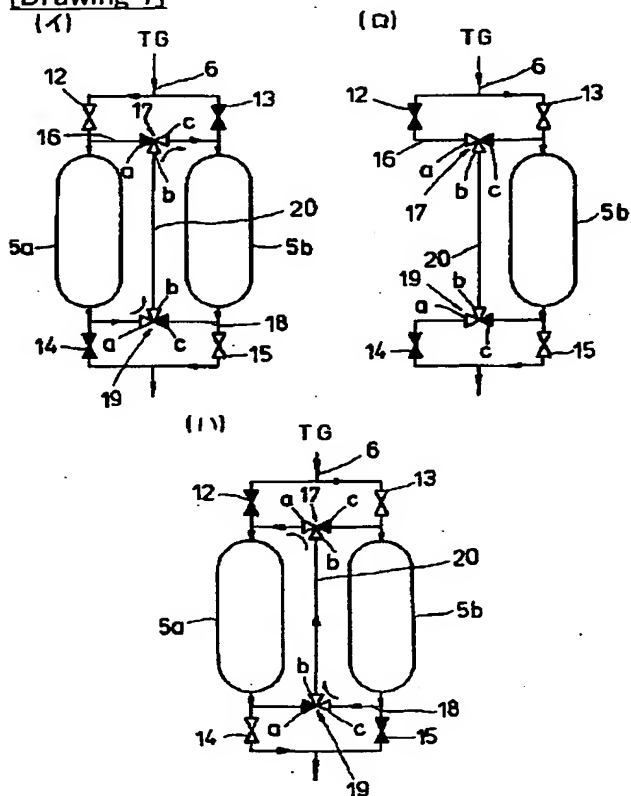
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

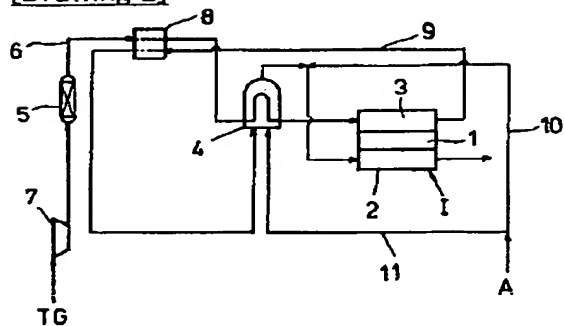
DRAWINGS

---

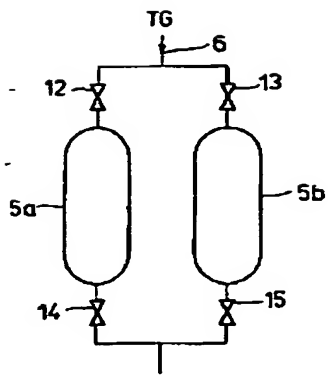
[Drawing 1]



[Drawing 2]



[Drawing 3]



---

[Translation done.]